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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
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NISKAYUNA, NY 12309

EXAMINER	
THANGAVELU, KANDASAMY	
ART UNIT	PAPER NUMBER
2123	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

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Office Action Summary	Application No.	Applicant(s)	
	09/976,582	DAFT ET AL.	
	Examiner	**Art Unit**	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,10,12,14-23,27,29 and 31-39* is/are rejected.

7)☒ Claim(s) *7-9,11,13,24-26,28 and 30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8 October 2001*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-39 of the application have been examined.

Information Disclosure Statement

2. Acknowledgment is made of the information disclosure statements filed on October 8, 2001 with a list of papers. The papers have been considered.

Drawings

3. The drawings submitted on October 12, 2001 are accepted.

Specification

4. The disclosure is objected to because of the following informalities:

Specification Page 12, Line 2, the equation is not clear and understood,

Specification Page 24, Para 0074, Line 10, the rectangle 34 is not shown in Fig.

5.

Specification Page 26, Para 3, Line 3, “simulated, as least so far as the ultrasound simulator” appears to be incorrect and it appears that it should be “simulated, at least so far as the ultrasound simulator”.

Appropriate corrections are required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1-3, 5, 6, 14, 19-20, 22, 23 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over **McKeighen** ("Optimization of broadband transducer designs by use of statistical design of experiments", IEEE 1995) in view of **Angelsen** (U.S. Patent Application 2001/0056236), and further in view of **Walker et al.** (U.S. Patent 6,692,439) and **Hughes et al.** (U.S. Patent Application 2001/0056256).

7.1 **McKeighen** teaches Optimization of broadband transducer designs by use of statistical design of experiments. Specifically as per claim 1, **McKeighen** teaches a method of jointly optimizing the performance of a probe and imager combination (Abstract, L1-3 and L6-8; Page 63, CL1, Para 3, L6-9; Page 63, CL2, Para 4, L1-3; Page 67, CL1, Para 3, L6-14; Page 67, CL1, Para 6, L1-4), comprising the steps of:

simulating images of a phantom which would be produced by the probe and imager combination in accordance with a statistical design of experiment (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14), the statistical design of experiment allowing a subset of the imager parameters to vary (Page 63, CL2, Para 2, L3-7; Page 65, CL2, Para 2 to Page 66, CL2, Para 1); and

quantifying to produce simulation-based image quality data (Page 65, Fig. 3; Page 67, Fig. 5; Page 68, Fig. 6; Page 69, Fig. 8).

McKeighen does not expressly teach that simulating images of a phantom which would be produced by the probe and imager combination in accordance with a probe geometry specification. **Angelsen** teaches that simulating images of a phantom which would be produced by the probe and imager combination in accordance with a probe geometry specification (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via

statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Angelsen** that included simulating images of a phantom which would be produced by the probe and imager combination in accordance with a probe geometry specification. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

McKeighen does not expressly teach that simulating images of a phantom which would be produced by the probe and imager combination in accordance with a set of imager parameters. **Walker et al.** teaches that simulating images of a phantom which would be produced by the probe and imager combination in accordance with a set of imager parameters (Figs. 3A and 3B; CL1, L39-41; Fig. 8A), because the brightness of the images is a function of many factors including transmit and receive transducer aperture geometry (CL1, L39-41). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Walker et al.** that included simulating images of a phantom which would be produced by the probe and imager combination in accordance with a set of imager parameters. The artisan would have been motivated because the brightness of the images would be a function of many factors including transmit and receive transducer aperture geometry.

McKeighen does not expressly teach quantifying the diagnostic value of each image simulated based at least in part on an image quality specification. **Hughes et al.** teaches quantifying the diagnostic value of each image simulated based at least in part on an image quality specification (Page 8, Para 0078, L29-33), because changing the image quality by changing the imager parameters and probe geometry will result in images of higher diagnostic value and will be more time and cost efficient (Page 8, Para 0078, L29-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Hughes et al.** that included quantifying the diagnostic value of each image simulated based at least in part on an image quality specification. The artisan would have been motivated because changing the image quality by changing the imager parameters and probe geometry would result in images of higher diagnostic value and would be more time and cost efficient.

7.2 As per claim 2, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the method of claim 1. **McKeighen** teaches that the simulating step comprises the step of computing an impulse response based at least in part on the specification of layers in the probe (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14; Fig. 1; Fig. 2; Page 69, CL2, Para 2; L1-8).

McKeighen does not expressly teach that the probe geometry specification comprises a specification of layers in the probe. **Angelsen** teaches that the probe geometry specification

comprises a specification of layers in the probe (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Angelsen** that included the probe geometry specification comprising a specification of layers in the probe. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

7.3 As per claim 3, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the method of claim 2. **McKeighen** teaches that the simulating step further comprises computing acoustic diffraction based at least in part on the impulse response, and the phantom (Fig. 1; Fig. 2; Fig. 6; Page 69, CL2, Para 2; L1-8).

McKeighen does not expressly teach that the set of imager parameters comprises a definition of aperture geometry, and the simulating step further comprises computing acoustic diffraction based at least in part on the definition of aperture geometry. **Walker et al.** teaches that the set of imager parameters comprises a definition of aperture geometry, and the simulating

step further comprises computing acoustic diffraction based at least in part on the definition of aperture geometry (Figs. 3A and 3B; CL1, L39-41; Fig. 8A), because the brightness of the images is a function of many factors including transmit and receive transducer aperture geometry (CL1, L39-41). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Walker et al.** that included the set of imager parameters comprising a definition of aperture geometry, and the simulating step further comprising computing acoustic diffraction based at least in part on the definition of aperture geometry. The artisan would have been motivated because the brightness of the images would be a function of many factors including transmit and receive transducer aperture geometry.

7.4 As per claim 5, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the method of claim 2. **McKeighen** teaches that the step of computing an impulse response employs an acoustic stack design (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14; Fig. 1; Fig. 2; Page 69, CL2, Para 2; L1-8).

McKeighen does not expressly teach that the step of computing an impulse response employs a one-dimensional acoustic stack design. **Angelsen** teaches that the step of computing an impulse response employs a one-dimensional acoustic stack design (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the electrical impedance matching as well as the

acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Angelsen** that included the step of computing an impulse response employing a one-dimensional acoustic stack design. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

7.5 As per claim 6, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the method of claim 1. **McKeighen** does not expressly teach the step of generating transfer functions based at least in part on the simulation-based image quality data. **Angelsen** teaches the step of generating transfer functions based at least in part on the simulation-based image quality data (Page 6, Para 0079; Page 7, Para 0082), because that would allow appropriate selection of center frequency for transmitter and effective bandwidth for reception (Page 6, Para 0079); and improvement of the transducer performance by appropriate selection of the layer parameters (Page 7, Para 0082). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Angelsen** that included the step of generating transfer functions based at least in part on the simulation-based image quality data. The artisan would have been motivated because that would allow

appropriate selection of center frequency for transmitter and effective bandwidth for reception; and improvement of the transducer performance by appropriate selection of the layer parameters.

7.6 As per claim 14, **McKeighen** teaches a computer system comprising a display monitor, an operator interface, and programming (Abstract, L1-3 and L6-8; Page 63, CL1, Para 3, L6-9; Page 63, CL2, Para 4, L1-3; Page 67, CL1, Para 3, L6-14; Page 67, CL1, Para 6, L1-4), for performing the following steps:

simulating images of a phantom which would be produced by the probe and imager combination in accordance with a statistical design of experiment selected via the operator interface ; and controlling the display monitor to display the simulated images (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14), the statistical design of experiment allowing a subset of the imager parameters to vary (Page 63, CL2, Para 2, L3-7; Page 65, CL2, Para 2 to Page 66, CL2, Para 1); and

quantifying to produce simulation-based image quality data (Page 65, Fig. 3; Page 67, Fig. 5; Page 68, Fig. 6; Page 69, Fig. 8).

McKeighen does not expressly teach that simulating images of a phantom which would be produced by the probe and imager combination in accordance with a probe geometry specification comprising at least a portion specified via the operator interface. **Angelsen** teaches that simulating images of a phantom which would be produced by the probe and imager combination in accordance with a probe geometry specification comprising at least a portion

specified via the operator interface (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Angelsen** that included simulating images of a phantom which would be produced by the probe and imager combination in accordance with a probe geometry specification comprising at least a portion specified via the operator interface. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

McKeighen does not expressly teach that simulating images of a phantom which would be produced by the probe and imager combination in accordance with a set of imager parameters comprising at least one imager parameter set via the operator interface. **Walker et al.** teaches that simulating images of a phantom which would be produced by the probe and imager combination in accordance with a set of imager parameters comprising at least one imager parameter set via the operator interface (Figs. 3A and 3B; CL1, L39-41; Fig. 8A), because the brightness of the images is a function of many factors including transmit and receive transducer aperture geometry (CL1, L39-41). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the

computer system of **Walker et al.** that included simulating images of a phantom which would be produced by the probe and imager combination in accordance with a set of imager parameters comprising at least one imager parameter set via the operator interface. The artisan would have been motivated because the brightness of the images would be a function of many factors including transmit and receive transducer aperture geometry.

McKeighen does not expressly teach quantifying the diagnostic value of each image simulated based at least in part on an image quality specification. **Hughes et al.** teaches quantifying the diagnostic value of each image simulated based at least in part on an image quality specification (Page 8, Para 0078, L29-33), because changing the image quality by changing the imager parameters and probe geometry will result in images of higher diagnostic value and will be more time and cost efficient (Page 8, Para 0078, L29-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Hughes et al.** that included quantifying the diagnostic value of each image simulated based at least in part on an image quality specification. The artisan would have been motivated because changing the image quality by changing the imager parameters and probe geometry would result in images of higher diagnostic value and would be more time and cost efficient.

7.7 As per claim 19, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** teaches that the simulating step comprises the step of computing an impulse response based at least in part on the specification of layers in the probe (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1

to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14; Fig. 1; Fig. 2; Page 69, CL2, Para 2; L1-8).

McKeighen does not expressly teach that the probe geometry specification comprises a specification of layers in the probe. **Angelsen** teaches that the probe geometry specification comprises a specification of layers in the probe (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Angelsen** that included the probe geometry specification comprising a specification of layers in the probe. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

7.8 As per claim 20, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** teaches that the simulating step further comprises computing acoustic diffraction based at least in part on the impulse response, and the phantom (Fig. 1; Fig. 2; Fig. 6; Page 69, CL2, Para 2; L1-8).

McKeighen does not expressly teach that the set of imager parameters comprises a definition of aperture geometry, and the simulating step further comprises computing acoustic diffraction based at least in part on the definition of aperture geometry. **Walker et al.** teaches that the set of imager parameters comprises a definition of aperture geometry, and the simulating step further comprises computing acoustic diffraction based at least in part on the definition of aperture geometry (Figs. 3A and 3B; CL1, L39-41; Fig. 8A), because the brightness of the images is a function of many factors including transmit and receive transducer aperture geometry (CL1, L39-41). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Walker et al.** that included the set of imager parameters comprising a definition of aperture geometry, and the simulating step further comprising computing acoustic diffraction based at least in part on the definition of aperture geometry. The artisan would have been motivated because the brightness of the images would be a function of many factors including transmit and receive transducer aperture geometry.

7.9 As per claim 22, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** teaches that the step of computing an impulse response employs an acoustic stack design (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14; Fig. 1; Fig. 2; Page 69, CL2, Para 2; L1-8).

McKeighen does not expressly teach that the step of computing an impulse response employs a one-dimensional acoustic stack design. **Angelsen** teaches that the step of computing an impulse response employs a one-dimensional acoustic stack design (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Angelsen** that included the step of computing an impulse response employing a one-dimensional acoustic stack design. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

7.10 As per claim 23, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** does not expressly teach the step of generating transfer functions based at least in part on the simulation-based image quality data. **Angelsen** teaches the step of generating transfer functions based at least in part on the simulation-based image quality data (Page 6, Para 0079; Page 7, Para 0082), because that would allow appropriate selection of center frequency for transmitter and effective bandwidth for reception (Page 6, Para 0079); and improvement of the transducer performance by appropriate selection of the layer

parameters (Page 7, Para 0082). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Angelsen** that included the step of generating transfer functions based at least in part on the simulation-based image quality data. The artisan would have been motivated because that would allow appropriate selection of center frequency for transmitter and effective bandwidth for reception; and improvement of the transducer performance by appropriate selection of the layer parameters.

7.11 As per Claim 31, it is a computer system claim with means for language but comprising same limitations as in claim 14. Therefore, it is rejected based on the same reasoning as Claim 14, supra. Claim 31 is taught throughout by **McKeighen, Angelsen, Walker et al.** and **Hughes et al.**

8. Claims 4, 10, 21 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over **McKeighen** ("Optimization of broadband transducer designs by use of statistical design of experiments", IEEE 1995) in view of **Angelsen** (U.S. Patent Application 2001/0056236), **Walker et al.** (U.S. Patent 6,692,439) and **Hughes et al.** (U.S. Patent Application 2001/0056256), and further in view of **Vilser** (U.S. Patent 6,621,917).

8.1 As per claim 4, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the method of claim 1. **McKeighen** does not expressly teach that at least some of the imager parameters are retrieved from a database containing respective sets of imager parameters for

pre-existing probes. **Vilser** teaches that at least some of the imager parameters are retrieved from a database containing respective sets of imager parameters for pre-existing probes (CL5, L25-28; CL22, L20-28), because the beamformer controller administers the database in which measurement, control and evaluation parameters are saved (CL5, L25-28; CL22, L20-28). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Vilser** that included at least some of the imager parameters being retrieved from a database containing respective sets of imager parameters for pre-existing probes. The artisan would have been motivated because the beamformer controller would administer the database in which measurement, control and evaluation parameters would be saved.

8.2 As per claim 10, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the method of claim 1. **McKeighen** does not expressly teach that the image quality specification is a function of at least the following: an image quality parameter and a range-dependent weighting coefficient corresponding to the image quality parameter. **Vilser** teaches that the image quality specification is a function of at least the following: an image quality parameter and a range-dependent weighting coefficient corresponding to the image quality parameter (CL37, L28-36), because weighting factors are used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values (CL37, L33-36). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Vilser** that included the image quality specification being a function of at least the following: an image

quality parameter and a range-dependent weighting coefficient corresponding to the image quality parameter. The artisan would have been motivated because weighting factors would be used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values.

8.3 As per claim 21, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** does not expressly teach a database containing respective sets of imager parameters for pre-existing probes, wherein at least some of the imager parameters are retrieved from the database. **Vilser** teaches a database containing respective sets of imager parameters for pre-existing probes, wherein at least some of the imager parameters are retrieved from the database (CL5, L25-28; CL22, L20-28), because the beamformer controller administers the database in which measurement, control and evaluation parameters are saved (CL5, L25-28; CL22, L20-28). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Vilser** that included a database containing respective sets of imager parameters for pre-existing probes, wherein at least some of the imager parameters were retrieved from the database. The artisan would have been motivated because the beamformer controller would administer the database in which measurement, control and evaluation parameters would be saved.

8.4 As per claim 27, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** does not expressly teach that the image quality

specification is a function of at least the following: an image quality parameter and a range-dependent weighting coefficient corresponding to the image quality parameter. **Vilser** teaches that the image quality specification is a function of at least the following: an image quality parameter and a range-dependent weighting coefficient corresponding to the image quality parameter (CL37, L28-36), because weighting factors are used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values (CL37, L33-36). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Vilser** that included the image quality specification being a function of at least the following: an image quality parameter and a range-dependent weighting coefficient corresponding to the image quality parameter. The artisan would have been motivated because weighting factors would be used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values.

9. Claims 12 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over **McKeighen** ("Optimization of broadband transducer designs by use of statistical design of experiments", IEEE 1995) in view of **Angelsen** (U.S. Patent Application 2001/0056236), **Walker et al.** (U.S. Patent 6,692,439) and **Hughes et al.** (U.S. Patent Application 2001/0056256), and further in view of **Smith et al.** (U.S. Patent Application 2003/0032884).

9.1 As per claim 12, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the method of claim 6. **McKeighen** does not expressly teach the step of optimizing the specification of layers in the probe based at least in part on the transfer functions. **Smith et al.** teaches the step of optimizing the specification of layers in the probe based at least in part on the transfer functions (Page 3, Para 0034), because that allows predicting the shape of the transfer function for the optimized design and optimizing the thickness of the matching layers (Page 3, Para 0034). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Smith et al.** that included the step of optimizing the specification of layers in the probe based at least in part on the transfer functions. The artisan would have been motivated because that would allow predicting the shape of the transfer function for the optimized design and optimizing the thickness of the matching layers.

9.2 As per claim 29, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 23. **McKeighen** does not expressly teach the step of optimizing the specification of layers in the probe based at least in part on the transfer functions. **Smith et al.** teaches the step of optimizing the specification of layers in the probe based at least in part on the transfer functions (Page 3, Para 0034), because that allows predicting the shape of the transfer function for the optimized design and optimizing the thickness of the matching layers (Page 3, Para 0034). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Smith et al.** that included the step of optimizing the specification of layers in the probe based

at least in part on the transfer functions. The artisan would have been motivated because that would allow predicting the shape of the transfer function for the optimized design and optimizing the thickness of the matching layers.

10. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over **McKeighen** ("Optimization of broadband transducer designs by use of statistical design of experiments", IEEE 1995) in view of **Angelsen** (U.S. Patent Application 2001/0056236), **Walker et al.** (U.S. Patent 6,692,439) and **Hughes et al.** (U.S. Patent Application 2001/0056256), and further in view of **Urbano et al.** (U.S. Patent 6,595,921).

10.1 As per claim 15, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** does not expressly teach that the image quality specification comprises at least a portion selected via the operator interface. **Urbano et al.** teaches that the image quality specification comprises at least a portion selected via the operator interface (Fig. 1; CL1, L49-51; CL8, L48-50; CL9, L44-61), because that allows different trade-offs to be made with different functions by reprogramming the logic devices in the ultrasound systems (CL9, L50-51 and L44-46); and using multi-line acquisition for higher image quality or composite image processing (CL9, L57-58). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Urbano et al.** that included the image quality specification comprising at least a portion selected via the operator interface. The artisan would have been motivated because that would allow different trade-offs to be made with different functions by

reprogramming the logic devices in the ultrasound systems; and using multi-line acquisition for higher image quality or composite image processing.

11. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **McKeighen** ("Optimization of broadband transducer designs by use of statistical design of experiments", IEEE 1995) in view of **Angelsen** (U.S. Patent Application 2001/0056236), **Walker et al.** (U.S. Patent 6,692,439) and **Hughes et al.** (U.S. Patent Application 2001/0056256), and further in view of **Weisman et al.** (U.S. Patent 6,674,879).

11.1 As per claim 16, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** does not expressly teach that the operator interface comprises a graphical user interface for selecting the statistical design of experiment. **Weisman et al.** teaches that the operator interface comprises a graphical user interface for selecting the statistical design of experiment (Fig. 5 to Fig. 10; CL1, L19-27; CL4, L54-59), because that allows selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments (CL4, L54-59). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Weisman et al.** that included the operator interface comprising a graphical user interface for selecting the statistical design of experiment. The artisan would have been motivated because that would allow selecting alternative processing

options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments.

11.2 As per claim 17, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** does not expressly teach that the operator interface comprises a graphical user interface. **Weisman et al.** teaches that the operator interface comprises a graphical user interface (Fig. 5 to Fig. 10; CL1, L19-27; CL4, L54-59), because that allows selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments (CL4, L54-59). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Weisman et al.** that included the operator interface comprising a graphical user interface. The artisan would have been motivated because that would allow selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments.

McKeighen does not expressly teach the operator interface for setting the at least one imager parameter. **Walker et al.** teaches the operator interface for setting the at least one imager parameter (Figs. 3A and 3B; CL1, L39-41; Fig. 8A), because the brightness of the images is a function of many factors including transmit and receive transducer aperture geometry (CL1, L39-41). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Walker et**

al. that included the operator interface for setting the at least one imager parameter. The artisan would have been motivated because the brightness of the images would be a function of many factors including transmit and receive transducer aperture geometry.

11.3 As per claim 18, **McKeighen, Angelsen, Walker et al.** and **Hughes et al.** teach the computer system of claim 14. **McKeighen** does not expressly teach that the operator interface comprises a graphical user interface. **Weisman et al.** teaches that the operator interface comprises a graphical user interface (Fig. 5 to Fig. 10; CL1, L19-27; CL4, L54-59), because that allows selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments (CL4, L54-59). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Weisman et al.** that included the operator interface comprising a graphical user interface. The artisan would have been motivated because that would allow selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments.

McKeighen does not expressly teach the operator interface the operator interface for specifying at least the portion of the probe geometry specification. **Angelsen** teaches the operator interface the operator interface for specifying at least the portion of the probe geometry specification (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the

electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Angelsen** that included the operator interface the operator interface for specifying at least the portion of the probe geometry specification. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

12. Claims 32-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over **McKeighen** ("Optimization of broadband transducer designs by use of statistical design of experiments", IEEE 1995) in view of **Ghosh et al.** (U.S. Patent 6,741,265), and further in view of **Weisman et al.** (U.S. Patent 6,674,879).

12.1 As per claim 32, **McKeighen** teaches that the first computer is programmed with transducer design advisor software (Abstract, L1-3 and L6-8; Page 63, CL1, Para 3, L6-9; Page 63, CL2, Para 4, L1-3; Page 67, CL1, Para 3, L6-14; Page 67, CL1, Para 6, L1-4); creating files which define a design of experiment analysis; and the second computer is programmed with simulation software for simulating images of a phantom in accordance with a design of experiment defined by the uploaded files (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63,

CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14).

McKeighen does not expressly teach a computer system comprising first and second computers connected via a network; and uploading the files to the second computer. **Ghosh et al.** teaches a computer system comprising first and second computers connected via a network; and uploading the files to the second computer (Abstract, L1-7; CL2, L32-41), because that would allow reducing costs and delays in communicating information regarding the system design (CL1, L11-14); and allow providing quality related analytical tools to analyze and evaluate product design at a sever for access to a number of parties through a communication network such as internet (CL2, L58 to CL3, L4). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Ghosh et al.** that included a computer system comprising first and second computers connected via a network; and uploading the files to the second computer. The artisan would have been motivated because that would allow reducing costs and delays in communicating information regarding the system design; and allow providing quality related analytical tools to analyze and evaluate product design at a sever for access to a number of parties through a communication network such as internet.

McKeighen does not expressly teach generating a series of graphical user interface windows; and creating files based at least in part on inputs to the windows. **Weisman et al.** teaches generating a series of graphical user interface windows; and creating files based at least in part on inputs to the windows (Fig. 5 to Fig. 10; CL1, L19-27; CL4, L54-59), because that

allows selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments (CL4, L54-59). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Weisman et al.** that included generating a series of graphical user interface windows; and creating files based at least in part on inputs to the windows. The artisan would have been motivated because that would allow selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments.

12.2 As per claim 33, **McKeighen, Ghosh et al.** and **Weisman et al.** teach the computer system of claim 32. **McKeighen** does not expressly teach that the second computer is programmed with file server software which handles transactions between the transducer design advisor software and the simulation software. **Ghosh et al.** teaches that the second computer is programmed with file server software which handles transactions between the transducer design advisor software and the simulation software (CL2, L58 to CL3, L4), because that would allow providing quality related analytical tools to analyze and evaluate product design at a sever for access to a number of parties through a communication network such as internet (CL2, L58 to CL3, L4). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Ghosh et al.** that included the second computer being programmed with file server software

which handled transactions between the transducer design advisor software and the simulation software. The artisan would have been motivated because that would allow providing quality related analytical tools to analyze and evaluate product design at a sever for access to a number of parties through a communication network such as internet.

12.3 As per claim 34, **McKeighen, Ghosh et al.** and **Weisman et al.** teach the computer system of claim 32. **McKeighen** teaches that first computer is further programmed with spreadsheet software having a design of experiment toolset for creating a design of experiment matrix (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14).

McKeighen does not expressly teach that the second computer is further programmed with analysis server software which provides communications links between the simulation software and the spreadsheet software. **Ghosh et al.** teaches that the second computer is further programmed with analysis server software which provides communications links between the simulation software and the spreadsheet software (CL2, L58 to CL3, L4), because that would allow providing quality related analytical tools to analyze and evaluate product design at a sever for access to a number of parties through a communication network such as internet (CL2, L58 to CL3, L4). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Ghosh et al.** that included the second computer being further programmed with analysis

server software which provided communications links between the simulation software and the spreadsheet software. The artisan would have been motivated because that would allow providing quality related analytical tools to analyze and evaluate product design at a sever for access to a number of parties through a communication network such as internet.

12.4 As per claim 35, **McKeighen, Ghosh et al.** and **Weisman et al.** teach the computer system of claim 32. **McKeighen** teaches that the simulation software comprises acoustic stack simulation software, ultrasound beam simulation software (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14); and design of experiment software for performing simulations in a design of experiment mode (Page 63, CL2, Para 2, L3-7; Page 65, CL2, Para 2 to Page 66, CL2, Para 1).

13. Claims 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over **McKeighen** ("Optimization of broadband transducer designs by use of statistical design of experiments", IEEE 1995) in view of and **Ghosh et al.** (U.S. Patent 6,741,265), and **Weisman et al.** (U.S. Patent 6,674,879), and further in view of **Vilser** (U.S. Patent 6,621,917).

13.1 As per claim 36, **McKeighen, Ghosh et al.** and **Weisman et al.** teach the computer system of claim 32. **McKeighen** does not expressly teach that the second computer is further programmed with scoring software which calculates an image quality value using weighting coefficients received from the first computer. **Vilser** teaches that the second computer is further

programmed with scoring software which calculates an image quality value using weighting coefficients received from the first computer (CL37, L28-36), because weighting factors are used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values (CL37, L33-36). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Vilser** that included the second computer being further programmed with scoring software which calculated an image quality value using weighting coefficients received from the first computer. The artisan would have been motivated because weighting factors would be used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values.

13.2 As per claim 37, **McKeighen, Ghosh et al.** and **Weisman et al.** teach the computer system of claim 34. **McKeighen** teaches that the design of experiment toolset comprises a regression tool for generating transfer functions based at least in part on the scoring (Page 63, CL2, Para 3, L6-17; Page 66, CL1, Para 1, L5-7).

McKeighen does not expressly teach that the second computer is further programmed with scoring software which calculates an image quality value using weighting coefficients received from the first computer. **Vilser** teaches that the second computer is further programmed with scoring software which calculates an image quality value using weighting coefficients received from the first computer (CL37, L28-36), because weighting factors are used to give

greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values (CL37, L33-36). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer system of **McKeighen** with the computer system of **Vilser** that included the second computer being further programmed with scoring software which calculated an image quality value using weighting coefficients received from the first computer. The artisan would have been motivated because weighting factors would be used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values.

14. Claims 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over **McKeighen** ("Optimization of broadband transducer designs by use of statistical design of experiments", IEEE 1995) in view of **Angelsen** (U.S. Patent Application 2001/0056236), **Walker et al.** (U.S. Patent 6,692,439) and **Weisman et al.** (U.S. Patent 6,674,879), and further in view of **Vilser** (U.S. Patent 6,621,917).

14.1 As per claim 38, **McKeighen** teaches a method of setting up a simulation in a design of experiment mode (Abstract, L4-6; Page 63, CL1, Para 3, L2-9; Page 63, CL2, Para 2, L3-16; Page 64, CL1, Para 1 to CL2, Para 1; Page 65, CL2, Para 2 to Page 66, CL2, Para 1; Page 67, CL1, Para 3, L6-14); and

creating computer files comprising specifications specified during the specifying steps in response to an input (Page 69, CL2, Para 2, L4-8).

McKeighen does not expressly teach specifying a probe geometry characteristic. **Angelsen** teaches specifying a probe geometry characteristic (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Angelsen** that included specifying a probe geometry characteristic. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

McKeighen does not expressly teach specifying an imager parameter. **Walker et al.** teaches specifying an imager parameter (Figs. 3A and 3B; CL1, L39-41; Fig. 8A), because the brightness of the images is a function of many factors including transmit and receive transducer aperture geometry (CL1, L39-41). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Walker et al.** that included specifying an imager parameter. The artisan would have been motivated because the brightness of the images would be a function of many factors including transmit and receive transducer aperture geometry.

McKeighen does not expressly teach specifying a weighting coefficient for an image quality parameter. **Vilser** teaches specifying a weighting coefficient for an image quality parameter (CL37, L28-36), because weighting factors are used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values (CL37, L33-36). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Vilser** that included specifying a weighting coefficient for an image quality parameter. The artisan would have been motivated because weighting factors would be used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values.

McKeighen does not expressly teach specifying a probe geometry characteristic by interacting with a first graphical user interface window; specifying an imager parameter by interacting with a second graphical user interface window; specifying a weighting coefficient for an image quality parameter by interacting with a third user interface window; and creating computer files comprising specifications specified during the specifying steps in response to an input to a fourth user interface window. **Weisman et al.** teaches specifying a probe geometry characteristic by interacting with a first graphical user interface window; specifying an imager parameter by interacting with a second graphical user interface window; specifying a weighting coefficient for an image quality parameter by interacting with a third user interface window; and creating computer files comprising specifications specified during the specifying steps in response to an input to a fourth user interface window (Fig. 5 to Fig. 10; CL1, L19-27; CL4, L54-59), because that allows selecting alternative processing options, consulting references and

generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments (CL4, L54-59). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **McKeighen** with the method of **Weisman et al.** that included specifying a probe geometry characteristic by interacting with a first graphical user interface window; specifying an imager parameter by interacting with a second graphical user interface window; specifying a weighting coefficient for an image quality parameter by interacting with a third user interface window; and creating computer files comprising specifications specified during the specifying steps in response to an input to a fourth user interface window. The artisan would have been motivated because that would allow selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments.

14.2 As per claim 39, activating creation of computer files comprising specifications specified (Page 69, CL2, Para 2, L4-8).

McKeighen does not expressly teach specifying a probe geometry characteristic. **Angelsen** teaches specifying a probe geometry characteristic (Page 3, Para 0030 to Para 0032; Fig. 4a; Page 6, Para 0074 to Para 0075; Page 6, Para 0078; Page 7, Para 0082), because as per **McKeighen** that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good

pulse integrity (Page 69, CL2, Para 2, L4-8). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the user interface of **McKeighen** with the user interface of **Angelsen** that included specifying a probe geometry characteristic. The artisan would have been motivated because that would allow optimizing the electrical impedance matching as well as the acoustic stack (ceramic, matching layers, lens, backing) etc. via statistical design of the experiments, and obtaining relative frequency bandwidth of 100% with high sensitivity and good pulse integrity.

McKeighen does not expressly teach specifying an imager parameter. **Walker et al.** teaches specifying an imager parameter (Figs. 3A and 3B; CL1, L39-41; Fig. 8A), because the brightness of the images is a function of many factors including transmit and receive transducer aperture geometry (CL1, L39-41). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the user interface of **McKeighen** with the user interface of **Walker et al.** that included specifying an imager parameter. The artisan would have been motivated because the brightness of the images would be a function of many factors including transmit and receive transducer aperture geometry.

McKeighen does not expressly teach specifying a weighting coefficient for an image quality parameter. **Vilser** teaches specifying a weighting coefficient for an image quality parameter (CL37, L28-36), because weighting factors are used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values (CL37, L33-36). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the user interface of **McKeighen** with the user interface of **Vilser** that included specifying a weighting coefficient for an image quality

parameter. The artisan would have been motivated because weighting factors would be used to give greater weighting to more dependable measured values and lesser weight to uncertain measured values in the determination of average values.

McKeighen does not expressly teach a first window for enabling a user to specify a probe geometry characteristic; a second window for enabling a user to specify an imager parameter; a third window for enabling the user to specify a weighting coefficient corresponding to an image quality parameter; and a fourth window for activating creation of computer files comprising specifications specified using the first through third windows. **Weisman et al.** teaches a first window for enabling a user to specify a probe geometry characteristic; a second window for enabling a user to specify an imager parameter; a third window for enabling the user to specify a weighting coefficient corresponding to an image quality parameter; and a fourth window for activating creation of computer files comprising specifications specified using the first through third windows (Fig. 5 to Fig. 10; CL1, L19-27; CL4, L54-59), because that allows selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments (CL4, L54-59). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the user interface of **McKeighen** with the graphical user interface of **Weisman et al.** that included a first window for enabling a user to specify a probe geometry characteristic; a second window for enabling a user to specify an imager parameter; a third window for enabling the user to specify a weighting coefficient corresponding to an image quality parameter; and a fourth window for activating creation of computer files comprising specifications specified using the first through third windows. The

artisan would have been motivated because that would allow selecting alternative processing options, consulting references and generating reports from pull-down menus, store, retrieve and transmit digitized images and reports easily with reduced time to perform the experiments.

Allowable Subject Matter

15. Claims 7-9, 11, 13, 24-26, 28 and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K. Thangavelu
Art Unit 2123
February 19, 2005

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PATENT EXAMINER